DOCUMENT RESUME

ED 035 093 64 EA 002 716

AUTHOR	Carpenter, C. R.
TITLE	The Quality of Instructional Materials. Final Report.
INSTITUTION	Pennsylvania State Univ., University Park. Dept. of Psychology.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-7-1142
PUB DATE	30 Aug 69
CONTRACT	OEC-1-7-0771142-4372
NOTE	41p.
EDRS PRICE	EDRS Price MF-$0.25 HC-$2.15
DESCRIPTORS	*Educational Quality, Facility Utilization Research, Instructional Films, *Instructional Materials, Instructional Programs, *Instructional Technology, *Media Specialists, Systems Approach, Televised Instruction

ABSTRACT

This article is the final report of a study defining the conditions, factors, and contingencies of quality in instructional materials. Several segments of the study are summarized and references supplied. The main procedure of the project was to directly confront selected people having informed and experienced judgments about quality in instructional materials. Small groups of educators and media specialists were organized for intensive discussions about the central question of how to achieve high quality in materials that are produced for and used in schools, colleges, universities, continuing education, and professional programs. The results are summarized, and recommendations are made. (MF)

BR 7-1142
PA 64
OE/BR

ED 035093

Final Report

The Quality of Instructional Materials

C. R. Carpenter

The Pennsylvania State University
Department of Psychology
214 Burrowes Building
University Park, Pennsylvania 16802

Tel: 814-865-2567

U. S. Office of Education
Bureau of Research Contract: OEC-1-7-0771142-4372
Andrew Molnar, Project Coordinator

August 30, 1969

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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EA 002 716

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The Quality of Instructional Materials

C. R. Carpenter,
Research Professor
Psychology and Anthropology

Introduction

This is the final report of a study done for the U. S. Office of Education, Bureau of Research, preparatory for the Commission on Instructional Technology as authorized by Title III of the Public Broadcast Act of 1967. The Commission was appointed in the spring of 1968 and began its formal work during the early summer of that year. Extensive staff work was done for the Commission by the Academy for Educational Development, including the collecting and making available to the Commission members of over two hundred documents. Support of Commission and staff work was provided by the U. S. Office of Education.

On July 24, 1969, the report of the Commission on Instructional Technology was submitted by its Chairman, Dean Sterling McMurrin, to James E. Allen, Jr., Assistant Secretary for Education, Department of Health, Education, and Welfare; and Commissioner of Education.

The Public Broadcast Act of 1967 had three titles: one which extended provisions for television and radio broadcast facilities; one which authorized the Public Broadcast Corporation, as recommended by The Carnegie Report; and one which authorized a Commission on Instructional Technology to conduct studies on a large number of different media ranging from teaching machines through advanced printing technologies and computers to research laboratories and production centers to satellite distribution systems.

General knowledge from the results of a special Study Group on research needs* of the U. S. Office of Education and the extensive reports and recommendations of the Advisory Committee for Media which was mandated

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*The members were C. R. Carpenter, John Carroll, Robert Gagne, Eric Gardner, Arthur Lumsdane, Mark A. May, and Wilbur Schramm.

by the National Defense Education Act of 1958, Title VII, served as the basis for predictions that the Commission on Instructional Technology would urgently need background information on all aspects of problems of the production and effective use of instructional materials. The latter, throughout its ten-year life, with its successions of alert membership, called attention repeatedly to needs for more instructional programs of high quality to match equipment development and procurement. It was not necessary to await the work of the commission, therefore, to know that a crucial area of its deliberations and recommendations would be that of high quality new instructional programs to be provided for the large and growing media distribution systems of the nation. More importantly, perhaps, the commission would confront the problems of relating high quality programs to critical social and educational needs. If the commission should define more clearly and broadly than had been done in the past the role of the federal government in the area of production and distribution of programs for instructional media, what would it need to know and say on the problem of quality of instructional materials?

Recognizing problems that the commission would need to deal with, the U. S. Office of Education, Bureau of Research, contracted for the study and preparation of reports in a half dozen or more areas. One among these was that of the high quality of instructional materials. What is it? How do you get quality? What are conditions, factors, and contingencies which affect quality? What research results relate to the building of high quality in instructional materials? Are the technical and operant qualities of instructional materials inherent in them or are they merely attributes of media programs? Are there conditions other than these inherent characteristics which limit or accentuate quality? How is the cost of increments of quality determined?

These were a few of the questions discussed by Andrew Molnar, project coordinator, with C. R. Carpenter, the prospective project director in arriving at agreements basic to a contract with The Pennsylvania State University to study the problem of quality. A proposal was prepared, processed, and accepted for a year's study entitled: Conditions, Requirements, and Variables Affecting the Quality of Complex Learning Mediated by Instructional Materials.

The Problem

The problem of attaining high quality in instructional programs has been extensively explored theoretically, and by research and development efforts sponsored by federal agencies and foundations. The greatest effort has been made by the U. S. Office of Education, Bureau of Research, which has conducted research and dissemination efforts for ten years, 1958-68. The definition and delineation of factors, conditions, and determinants of quality and/or effectiveness have largely eluded the grasp alike of investigators and practical educators. The disturbing and ubiquitous findings of "no statistically significant differences" have arisen by the hundreds to smite those who have striven by neatly controlled research and analytical procedures to bring the variables and contingencies of quality into ordered conceptual and operational frames.

Two intersecting trends have arisen again and again relative to the quality problem. Research and development work involving the use of "new" media in education, instruction, and training is one trend that began importantly during World War II and was accelerated by the National Defense Education Act of 1958. The other interacting trend was extensive and persisting attempts to apply "learning principles" to instructional situations by means of the media (including print, audio and video) and complex media systems including computer regulators of learning behavior.

Two subordinate developments contributed to an increasing interest in the awareness of the problem of quality. First, there were many efforts made, about 400 for television alone, to answer the question of what medium and patterns of use of media are more effective, practical, and economical. Here emerged the effectiveness, productivity cost/benefit ratios kinds of thinking about instruction and media. Second, "programed instruction and teaching machines" swept into the educational bivouacs disturbing their structure while at the same time contributing to the art of writing specifications for instructional materials and the formulation of criteria for learned performances.

Orienting Concepts

The questions that were of deep concern to the project director were these: What orienting concepts, approaches, methods, procedures, and techniques could possibly make new contributions to thinking about and research on the quality problem? What could be gained that has not already resulted from great effort and sustained research and development work for twenty years to improve quality of media programs? What conventional and unconventional methods might be used to collect useful information and to draw conclusions for the prospective Commission on Instructional Technology which would affect the recommendations it would make to the President and the Secretary of Health, Education, and Welfare? How could a broad and useful perspective be developed based on the results of previous research and development that, with the impetus given by the commission, could make a significant practical difference in the effectiveness and extent of use of media in the educational systems of the nation?

Studies of developments in the fields of education, learning, communication technologies, and related theories suggested that the following orienting concepts may be useful:

1. Concepts using the "systems approach" of instructional technology.
2. Concepts involving functional and operational approaches which specify precisely what operations shall be carried out by what instruments or people to achieve stated learning objectives.
3. Concepts of multi-media and multi-mode patterns or configurations which, when organized, operate together as interlocking instrument-human systems.
4. Concepts of fields of forces (as contrasted with single variables) in which the parts interact algebraically (with plus and minus effects) to produce learning.
5. Concepts of sequential operations in which prior operations determine, limit, facilitate, and interfere with subsequent events.
6. Concepts of feedback loops or nets of a more general cybernetic system.
7. Concepts of design specifications with criteria for judging behavioral changes that can be detected or observed and thus known to result.

A simplified conception of the task was that of working within a modified systems concept to select and use methods, procedures, and techniques

which would define the factors, conditions, and contingencies that have negative and positive effects on any one or all of the steps and operations included in the procurement and/or production, distribution, and use of instructional materials. Accordingly, it was expected that application of appropriate procedures would make it possible to define in more detail than has been done heretofore the necessary and enhancing conditions as well as the barriers and barricades which have deterministic relations to effectiveness or high quality of instructional programs.

It was believed that a number of research and development practices in the past have led to blind alleys and statistically nonsignificant difference findings. In a sense, these were the misconceptions and erroneous expectations:

1. That any limited sets of single variables, e.g., color, music, first person commentary, direct address, would make significant differences in complex learning.
2. That transfer occurs widely from one to another and different sets of stimulus conditions, or from one set of responses to others, and from a learning situation to other and different sitations of application.
3. That exposure to stimulus materials or programs of instruction will directly and certainly result in the expected learning with different learners.
4. That behavioral changes characterized by adaptation and learning are affected by limited ranges of cognitive and emotional experiences, for example, that learning in one "course" is separate from other courses, and that learning occurs separately from the storms and stresses of personal adjustments.
5. That learning can occur on a significant level without active participation, involvement, and <u>appropriate kinds of responses</u> and practices.
6. That elaborate, complex, and dramatic stimulus conditions (which are often very expensive to produce) will be more effective generally than simple, clean, and strong patterns of stimulus conditions.
7. That learning can occur without being targeted to clearly specified learners' characteristics and without having well known objectives and that learning can occur without feedback of information <u>to the learner</u> about degrees to which he approximates in his learning the specified or ideal response objectives.

These orienting concepts and critical viewpoints began to point generally to the methods which might be used feasibly in the conduct of the

project for the commission dealing with factors contingent to high quality of instructional materials and programs.

Methods and Procedures

The problem of instructional quality, the consideration of alternative approaches, and orienting concepts and viewpoints all indicated that somewhat different methods and procedures from the traditional should be used for the conduct of this study of quality. Clearly time and funding limitations precluded the making of a research and development approach, nor was this expected. However, the anticipated needs of the commission were that the result of theoretical research and development investigations and studies in brief form were urgently required. Therefore, a first and very conventional procedure was indicated: namely, the collection, abstraction, and production (on McBee edge-punched cards) of abstracts of the literature pertinent to the problem of instructional quality. The developing ERIC Media Center at Stanford University was not yet in a position to be of great assistance to the commission. Furthermore, the media literature is so scattered and varied, characterized by limited and special publications, that it is extremely difficult to survey the published information in an orderly manner. It was planned to send copies of the abstracts to the Academy for Educational Development which was responsible for the staff work for the staff work for the commission, to the U. S. Office of Education and to the ERIC Media Center. It was not proposed once again to make a review of the literature.

It was decided that the main procedure would be to confront directly selected people having informed, mature, and experienced judgments with the problems of defining the conditions, requirements, and variables affecting the quality of complex learning mediated by instructional materials.*

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*In early plans, emphasis was put on television programming for instructional purposes. However, as the project evolved and conceptualizations deepened and broadened, the study came to include a very wide spectrum of instructional materials including both "new" electronic media and print. This viewpoint was communicated to the Commission.

Nine places were selected in the eastern part of the United States where it would be practical to organize small groups of professional educator-media professionals for intensive discussions about instructional materials and especially on the quality problem. Men and women were invited who were well known in their professions, and who had research and extensive practical experience. The invited seminar members were persons who were recognized for their interests and competencies in research, development, and the application of instructional media to varied problems of education, the sciences, engineering, and the arts. Since a large number of such persons were at Penn State and since this university had the contract for the study, four seminars were scheduled there. Similar harvest seminars of information and authoritative judgments involved participants from five other universities. Three seminars were scheduled in places conveniently located for specialists and authorities from other educational organizations and from the military services. A total of about 100 people who could make substantive contributions to the thinking on the central questions of how to achieve high instructional quality of materials that are produced for and used in schools, colleges, universities, continuing education, and professional training programs was selected and invited to attend the seminars.

In the beginning the harvest seminars were exploratory and yielded information on how best the other seminars could be conducted. These first sessions were a seminar at Indiana University and one with faculty from both the University of Notre Dame and Purdue University. It became evident that due to the high level of deliberations, the broad perspective involved, and in general the complexity of the judgments and decisions that were required, an outline or framework was necessary for guiding the discussions. Consequently, the project director designed the attached chart (p. 7a) for the primary purpose of having a general guide for subsequent seminar discussions. Actually, this chart has become a format or outline for the whole project, and it has served many other purposes including a framework for presenting conclusions of the study.

In order to have focused discussions, attention was sometimes directed to particular media like instructional films, television, or

SEQUENTIAL OPERATIONS OF INSTRUCTIONAL SYSTEM

1 Social Needs	2 General Purposes & Goals	3 Requirements & Specifications	4 Selection, Transformation & Production	5 Library Functions	6 Distribution Strategies	7 Conditions of Use	8 Learner Interaction with Program Materials	9 Effects Assessment	10 Cybernetic System
Population	Hierarchies	General Purposes & Objectives	Search, Select, Adapt, Acquire	Materials Acquisition	Selection of Distribution System	Place	Audience Characteristics Maturation	Ways of Measuring	Information Feedback
Characteristics	Specific Instances	Specific Operational Instructional Objectives	Not Existent / Existent: not appropriate / appropriate	Distribution & Classification	TV Broadcast Satellites Cable Point to Point Closed Circuit	Time	Interest	Concept Change	Each Panel of Operations
Definitions	Instructional Objectives	Performance Objectives	adapt	Storage	Radio	Reinforcement - Interference	Active - Passive	Attitude Change	Appropriate
Priorities	Operational Considerations	Design Strategies & Styles	transform	Retrieval	Print	Context of Use	Relevance	Behavior Change	Useful
Extent & Kind		Media Characteristics of Units	modify	Distribution to Switching Centers		Perception Processes Responses	Involvement		Adequate
Basis for Justification		Resources	produce	Transmission or Distribution to Places & Points of Use		Individual Alone In Group Kinds & Effects	Controlled - Uncontolled		
Criteria			(See Production Flow Chart)	Recovery & Repeat Cycle			Abilities		
							Applied Learning Principles		

Selected and Targeted "Feedback" Information

computers as they might be brought to bear on problems of teaching and learning in a course of instruction, or in a more limited or more general area of the curriculum. However, the perspective was always broad and references were made to all media and to a wide spectrum of their uses.

The settings of the harvest seminars and the procedures used were selected and designed to yield unrestrained and imaginative thinking about the quality problem. The seminar members were encouraged to bring their best focused judgments to bear on the problem: quality factors in instructional materials. Freedom of thinking and conceptual explorations were encouraged while severely critical reactions, typical of academics, were discouraged.

The harvest seminar settings were arranged to be out of the mainstream of activities and away from distractions. Sufficient time was provided for reorientation and disengagement of seminar members from their regular work, and for becoming personally involved in the issues of what high quality instruction means and how it can be attained in a very broad spectrum of educational efforts in this nation.

Orientation of the discussions, that is, the setting of the problem, was most important. Discussion group leaders usually challenged the members from the beginning to define and understand the quality problem and to formulate expectations of results from the extended and intensive discussions. Participants were challenged to make substantive, significant, and realistic recommendations for the proposed Commission on Instructional Technology. These recommendations centered on what needs to be done throughout this country to produce and make available instructional programs of the highest quality and effectiveness.

In the beginning of a seminar each member was told that near the end of the discussions he would be asked to make for the record one, two, or three of the most important statements that he could make on the general question, "how best to improve the quality of instructional materials for use in a wide range of available technologies at specified levels of education."

In some of the seminars simulation and role playing techniques were used. Members were instructed to assume realistic decision-making roles in areas of responsibility for which they believed themselves most

competent. This was done in some instances by asking the question: "Suppose that you were responsible for drafting the recommendations to the President of the United States for the commission on how adequate instructional programs for the media are to be produced on the highest possible levels of quality and effectiveness, what would be the content and form of your recommendations?" Or, again, "What are the most important requirements and conditions for producing instructional programs of the highest quality in your field of teaching?"

Early in almost all harvest seminars, the issue arose of how quality was to be defined

In order to expedite discussions, it was decided to define quality for all seminars after the first as being synonymous with effectiveness, and therefore, the full instigation, stimulation, and assurance of the production of the intended specified changes in the behavior of the defined population of learners.

There were two subordinate ideas: first, quality or effectiveness is a continuum of degrees of quantity that invite measurements and not an absolute quality or quantity, and second, the intended or proposed changes in behavior must be specified and clearly expressed so that the instructional objectives can be known by all those responsible for the management and regulation of the teaching and learning operations, including learners themselves.

The harvest seminar deliberations and discussions were recorded on audio-tape, analyzed, and written up in reports. Both the audio recording and the typed abstract of discussions became the main products and primary data base for this study.

Report Results. The early harvest seminars yielded two other results: First, it became clear that intelligent, experienced professionals who are interested in the useful and practical consequences of instructional methodology and in the contextual validation of the results of instruction cannot deal with the problem of quality when limited to inherent characteristics or attributes of instructional materials alone. These educational media professionals believe that integral sequences of events and broader contexts must be controlled and managed if high quality is to be achieved.

Related to this viewpoint is the contemporary reluctancies to evaluate a single or even a few "independent" variables, or to make comparative effectiveness studies except for practical management purposes. This is clearly due to a growing realization that a large number of factors, conditions, and contingencies, including residues of the life history of the learner and the life history of units or programs of instructional materials, affects the changes of behavior known as learning. Second, there are large macroscopic educational management problems, priorities, finances, methodologies, production, procurement, distribution, use, and evaluations that must be solved satisfactorily before the fine microscopic research problems and their solutions can be dealt with effectively or indeed can have any significant practical effects on learning. Often the macroscopic override the microscopic factors. Not only during the early harvest seminars, but also during the entire series of twelve seminars involving a total of 117 hours of deliberation, a limited number of references were made and there was a lack of emphasis on the finding of controlled research and its relation to the quality of instructional materials for learning. The harvest seminar reports, without serious content editing, were included in a principal report entitled Quality Factors in Instructional Materials.*

Special Studies. The basic harvest seminars, the literature searches, and contemporary practices suggested special studies, two of which were speedily undertaken, subject to the limitations of time, funds, and staff assistance. First, it became abundantly clear that the prescriptions and formulas that are offered for the production, testing, revision, and retesting cycles in the preparation of instructional materials cannot be done practically except in centers which have the necessary characteristics. Therefore, more practical and short-cut procedures will continue to be required. Once again it was emphasized, also, that forms for guiding informed human judgments in assessing instructional units, lessons, and

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*Carpenter, C. R. and Carpenter, Ruth J. Abstracts of Seminar Discussions on Quality Factors in Instructional Materials. The Pennsylvania State University, University Park, Pennsylvania 16802. U. S. Office of Education. Project Number OEC-1-7-071142-4372. ERIC Media Center, Stanford University, California. 1968.

programs will continue to be needed and will serve useful purposes. Therefore, continuing a process begun fifteen years ago, yet another attempt was made to revise and make useful a measurement form, Practical Procedure for Assessing Instructional Film and Television Programs.* This judgmental form was tested by program professionals who used it to judge television programs and films nominated as being superior. The intent of this effort was to improve the evaluation form and the practical procedures for its use.

A second problem for study early emerged. It has been evident for several years from studies sponsored by the U. S. Office of Education that it is necessary to have a national complement of instructional material production centers or laboratories. These are required especially for production of nonprint materials. In some respects the research and development centers and regional education laboratories sponsored under Title IV of the Elementary and Secondary Education Act of 1965 served as models for developing, creating, producing, and testing instructional and experimental materials. These agencies are not expected to specialize in production. It was expected, therefore, that the Commission on Instructional Technology would need to consider whether or not to recommend federal support commensurate with the needs for a national complement of production and testing centers. Consequently, a special study was made of the places and facilities known to be producing instructional programs of high quality for the electronic media. A special report was written, Educational and Instructional Television Facilities Evaluation: Preliminary Practical Procedures.** The objective of the study was to begin to develop planning and evaluating procedure on the basis of direct observations of existent facilities and from inquiries made of all National

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*Carpenter, C. R., and Froke, Marlowe. Description of a Practical Procedure for Assessing Instructional Film and Television Programs. The Pennsylvania State University, University Park, Pennsylvania 16802. U. S. Office of Education. Project Number OEC-1-071142-4372. 1968.

**Carpenter, C. R., and Carpenter, Lane E. Educational and Instructional Facilities Evaluation: Preliminary Practical Procedures. The Pennsylvania State University, University Park, Pennsylvania 16802. U. S. Office of Education, Contract # OEC-1-7-071142-4372. ERIC Media Center, Stanford University, California. 1968.

Education Television (NET) stations. Television was accepted as a multi-media originating-distribution system and viewed as a good example of the kinds of demands that may be made in the future on new and advanced instructional material production centers.

A fourth substantive document was prepared. As was previously reported, members of the harvest seminars were invited and expected to present clear, succinct statements on their proposals of how to solve the quality of instructional materials. These statements, some of which were made orally, were edited and produced under the title of Quality Factors in Instructional Materials: Significant Statements by Authorities.*

The Quality Factors in Instructional Materials and Significant Statements by Authorities are the two main substantive reports. Those on program assessments and on facilities are expected to contribute to methodology. Whereas the assessment report will be found useful by teachers, producers of instructional materials, investigators, and users of the instructional media, the report on instructional television facilities will be the most useful to those who put into effect the recommendations of the Commission on Instructional Technology which have relevance to national complements of production centers.

In an attempt to engage the attention of the commission members, an audiotape recording was made especially for them. It presented a selected number of oral statements by authorities who commented on critical aspects as they saw them, of the quality problem of instructional materials. This tape was presented to the commission during its first meeting in Washington and a reference copy was deposited with the U. S. Office of Education.

A third kind of report has been presented. Earlier it was stated that the project on the quality problem would be recorded and reported in multi-media form. One hundred and seventeen hours of sound recordings were made of harvest seminar discussions. Typed transformations and records were made of all these tapes. Furthermore, in an attempt to

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*Carpenter, C. R., and Reilly, Susan S. Quality Factors in Instructional Materials: Significant Statements by Authorities. The Pennsylvania State University, University Park, Pennsylvania 16802. U. S. Office of Education, Project Number OEC 1-7-071142-4372, ERIC Media Center, Stanford University, California. 1968.

produce a report that may be seen and heard by a larger than usual audience, working with WPSX-TV of The Pennsylvania State University, a ninety-minute summary report of the project was produced on videotape. The general and special titles were Conversations on Educational Technology; C. R. Carpenter. Marlowe Froke was the moderator. A separate sound tape of the commentary was made and put into circulation through the Audiotape Library, Audio-Visual Services, The Pennsylvania State University.

The Investigator-Commissioner

In April 1968, the project director was invited to be one of nine members of the Commission on Instructional Technology. He was later made a member of the Executive Committee. Therefore, before the extended study for that commission was completed, its director was put into an extraordinarily favorable position for directly transmitting to the commission the general and special reports in printed, videotape and audiotape forms, but perhaps more importantly he was given the opportunity to communicate information and the effects of the study directly to the commission. Conditions of instructional technology, critical needs, and mature judgments based on evidence could be communicated verbally to the commission with appropriate timing and cogent arguments. Rarely has an investigator had a better opportunity to directly and speedily affect plans and policy proposals. It is believed that as a consequence this study had unusual effects on the work of the commission and the kinds of recommendations proposed to the President and the Secretary of Health, Education, and Welfare.

The staff work for the commission was done under contract with the Academy for Educational Development, Washington, D. C. As a commissioner, it became possible for the project director, partially as a result of this study, to give special assistance to the Academy in selecting staff members who represented the media professions, suggesting subjects and possible authors for contributed and commissioned resource papers, providing early and special bibliographies for commissioners, and recommending

a special purpose Academy Information Center on the very large field of instructional technology. In addition, assistance was given about places and facilities which should be studied and observed by commissioners and staff members, and in arranging for instant seminars on urgent problems, modeled somewhat after the harvest seminars of the present study.

Transition

Therefore, it is clear that both the selection of the quality problem for the study, as it developed, and the selection of Penn State for conducting the study were fortunate. The results of the project had direct channels to the Commission on Instructional Technology. Some of the conclusions surely have corresponded with some of the recommendations of the commission.

Two additional observations complete the preparation for describing generally the results of this germinal study on conditions, factors, and contingencies of quality in instructional materials.

First, for ten years, much of the work in media of the U. S. Office of Education has been done under the headings of research and dissemination. However, most of the classes of activities designated as research have been development and application. Most of the dissemination activities sought to promote involvement of significant people and to influence them by instruction, information, and interactions to accept and to use instructional media.

The harvest seminars became, in the judgment of many participant-observers, extraordinarily effective as a method for communicating and exchanging information and for influencing the actively committed participants themselves. A basic condition to these effects was the selection of professionally competent and strongly interested men and women to compose the seminars. They were, also, personally involved in important live issues of the effectiveness of teaching and learning, and were interested in having for their work teaching materials of high quality. The groups were small, under twelve in number, and rather intense interactions occurred among seminar members. There was no escape for the timid into

anonymity. Furthermore, each individual had final specific assignments for which the first part of the seminar could be preparation. This period could be used for scanning of experiences and knowledge, for selecting of a few most important points, and for formulating statements and recommendations. Each participant had a serious job of public, professional performance in the making of his personal statements before his colleagues and for the audio recording as well as for later publication. Finally, participants, by having role assignments, reacted with realism and the belief that their language may have consequences in terms of public policies.

The harvest seminars were also germinal seminars. They gave active responsible people from the same or neighboring universities and educational agencies the chances they continuously need, but rarely have, to think deeply and exchange judgments about fundamental issues of neglected subjects of teaching and learning, and about the quality of learning materials, resources, and technologies in terms of their effects on students.

The seminars were germinal in a second sense. They provided the somewhat unusual experience for most people to act as if, and with hope, that they could influence future legislation and federal support programs on matters of great importance, the improvement of the quality of instructional materials, of teaching and learning, and hence, the effectiveness and relevance of the educational system to the life of the nation.

Subject Headings and Key Terms

A Finding Procedure

for

Abstracts of Seminar Discussions

on

Quality Factors in Instructional Materials

The condensed substantive content yielded by the harvest seminars does not permit effective summarization. Therefore, the vast range of concepts and expressions necessitates a finding procedure. The following subject headings give also abbreviations of the reference seminar like PSI meaning Pennsylvania State University, Seminar I, and page number where the concept occurs.

Studies of the problems of the taxonomy of the media literature have led to the conclusion that work is urgently needed to compile key terms. The harvest seminars have yielded, by means of a deductive procedure, an extensive list of terms that may be used in discussions of instructional media and those factors related to the quality and effectiveness of instructional materials.

The subject headings are organized under the general panel headings of the chart entitled "Sequential Operations of Instructional Systems."* The seletion and organization of key terms was done by Ruth J. Carpenter.

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*See chart on page 7a.

Abbreviations

Ind	Indiana University
ND	Notre Dame--Purdue Universities
Ill	University of Illinois
PSI	Pennsylvania State University--Seminar I
PSII	Pennsylvania State University--Seminar II
PSIII	Pennsylvania State University--Seminar III
PSIV	Pennsylvania State University--Seminar IV
Wash	Washington, D. C., National Association of Educational Broadcasters.
Atlanta	Atlanta, Georgia, Southern Regional Education Board
BR	Boca Raton, Florida Atlantic University
UGA	University of Georgia, Center for Continuing Education
QR	Quail Roost, North Carolina

Subject Headings and Key Terms

Quality Factors in Instructional Materials

1. SOCIAL NEEDS: (Ind 1, ND 1, PSI 1, PSII 1, Wash 1, Atl 1, BR 1, Ga 1, QR 1)
   - 1.1 National Goals (Ind 1)
   - 1.2. University Role (PSII 1)
     - 1.2.1. Administrative Decision Making (PSII 1)
   - 1.3. Definitions (PSII 1)
     - 1.3.1. Quality (PSII 1)
   - 1.4. Priorities (ND 1)
   - 1.5. Criteria (ND 1, Wash 1)
   - 1.6. Extent and Kind (PSI 1, PSII 2, Atl 2, QR 1, ND 1)
     - 1.6.1. Vocational Education (PSII 2, Atl 2, QR 1, ND 1)
     - 1.6.2. Adult Education (PSI 2, Atl 2)
     - 1.6.3. Education of the Disadvantaged (PSI 1, QR 1)
   - 1.7. Federal Legislation (PSII 2, BR 1, QR 1)
   - 1.8. Basis for Justification
   - 1.9. Population (BR 1, Ga 1, PSI 1)
   - 1.10. Characteristics (Wash 1, Ga 1)
     - 1.10.1. Specific Uses (Wash 1)
   - 1.11. Logistical Support of Instructional Systems (Atl 1)

2. GENERAL PURPOSES AND GOALS (Ind 1, ND 2, PSI 2, PSII 3, Wash 2, PSIII 1, Atl 5, PSIV 1, Ga 2, QR 1)
   - 2.1 Instructional Objectives (Ind 1, ND 2, PSI 2, PSII 3, Wash 2, Atl 5, PSIV 1, Ga 2, QR 1)
     - 2.1.1. Information Transfer or Proficiency Development (ND 2, QR 2)
     - 2.1.2. Motivation of Students (ND 2, PSI 2, PSIV 1)
     - 2.1.3. Counseling (ND 2)
     - 2.1.4. Peer Group Reinforcement (ND 2, PSI 3)
     - 2.1.5. Continuing Education (ND 2)
     - 2.1.6. Research in Educational Methods (ND 2, PSIV 1, QR 2)
     - 2.1.7. Return Benefit to the Institution (ND 2)

2.1.8. Placement (ND 3)

2.1.9. Secondary School Science Curriculum (ND 3)

2.1.10. Synthesis of Research and Experience (Atl 5)

2.1.11. Expressive Objectives (PSIV 2)

2.2. Role of the Media (Ind 1, ND 4, PSI 3, Wash 2, PSIII 1, Atl 7, PSIV 2, Ga 3)

2.2.1. Characteristics of the Media (PSI 4, Wash 2, PSIII 1, QR 3)

2.2.1. a. Role of the Teacher (Wash 3, QR 3)

2.2.2. Classification (Atl 7)

2.2.3. Criteria for Use (Atl 8)

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2.2.5. Television (Ind 1, ND 4, PSIII 1, Atl 8)

2.2.5. a. General (ND 4)

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3.1.4. f. Boston (Wash 7)

3.1.4. g. U. S. Army Southeastern Training School (Atl 10)

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3.1.4. i. Florida Atlantic University (BR 2)

3.1.4. j. Communicable Disease Center, Atlanta (Wash 7, Atl 12)

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7.2.5. Florida Atlantic University (QR 8)

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8.1. Audience

8.1.1. Characteristics

8.1.2. Maturation

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8.2.1. Active

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8.3. Relevance (Ga 6)

8.4. Purposes of Audience

8.5. Involvement (PSIV 9)

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9.1. Ways of Measuring (Ind 7, ND 18, I11 13, PSI 13, PSIII 8, FA 10)

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9.1.2. a. Baxter Chemistry Course (ND 19)

9.1.2. b. Physical Sciences Curriculum Study

9.1.2. c. University of Chicago

9.1.2. d. Boring's Psychology Course (ND 20)

9.1.2. e. Indiana Medical Center (Ill 14)

9.1.2. f. University of Illinois (Ill 14)

9.1.3. Pretesting in Production Stages (Ind 7, PSIII 8, BR 10)

9.1.4. Nonmeasurable Effects (PSIII 9)

9.1.5. Testing Organizations (PSIII 9)

9.1.6. Testing Theory (PSIII 9, QR 9)

9.2. Behavior Change (ND 20, Wash 12)

9.3. Concept Change

9.4. Attitude Change (QR 9)

10. CYBERNETIC SYSTEMS (PSIII 10, QR 9)

10.1. Information Feedback (PSIII 10, QR 9)

10.1.1. Social Needs

10.1.2. General Purposes and Goals

10.1.3. Requirements and Specifications

10.1.4. Selection, Transformation, and Production

10.1.5. Library Functions

10.1.6. Distribution Strategies

10.1.7. Conditions of Use

10.1.8. Learner Interaction with Program Materials

10.1.9. Effects Assessment

10.2. Appropriate

10.3. Useful

10.4. Adequate

Results

What in general resulted from the study of factors, conditions, and contingencies affecting complex human learning?

First, to understand and to be able to produce instructional materials of high quality and effectiveness in a very wide range of kinds, those materials for a unit, a course, or a curriculum must have favorable conditions and factors operating over a very wide spectrum of resources, decisions, actions, interactions, and people-thing contingencies. Stated differently, to understand the quality factors of instructional materials requires the use of a systematic analysis of all significant and relevant conditions which operate during the life history, and over the full context of the conception, design, procurement, distribution, use, and evaluation of the materials. The discussions, after the first three harvest seminars, ranged over ten broad sets of factors or conditions. These headings symbolized generally the sets of factors and conditions that are believed to relate significantly to quality.

The following lists give some of the general subject headings that represent many but not all of the factors and conditions that are judged to be contingencies to quality, when quality is defined to mean the learning associated with defined and observable or detectable behavioral changes.

Sequential Operations of an Instructional System

1. Social Needs.
2. General Purposes and Goals.
3. Requirements and Specifications.
4. Selection, Transformation, and/or Production.
5. Library Functions.
6. Distribution Strategies.
7. Conditions of U
8. Learner Interactions with Materials.
9. Assessment and Measurement.
10. The Cybernetic Sub-system.

The Ideal Context:

Within this complex operational system of elements and conditions which determines the effectiveness and efficiency of instructional materials, there are networks of interactions at all steps leading from the completion of the performance specifications and patterning of designs to effects assessments. Included are the sub-cycles of events that characterize procurement or production and testing. The library and distributive functions are equally interactive. Learning theory applications occur in the preparation phases and in the conditions or situations of use of the learning materials. Measurement and assessment procedures provide for the cybernetic network of effects which ideally are reported to the learners and which influence all interactions within the Sequential Operations System.

Themes. There were several major themes that developed, recurred, and were emphasized over and over again during the 117 hours of the deliberative discussion:

1. The "systems approach" and strategies were generally approved and used as a frame of reference for conceptualizing contingencies to quality of instructional materials.
2. There was agreement that the results of controlled and quantitative research on learning processes are most valuable guides, but they require translation, transformation, interpretation, and synthesis before useful application can be made for regulating learning.
3. Educators, teachers, and students must master the technologies of instructional media and avoid permitting the media to manage them.
4. For most complex instruction, several modes of communication will need to be used, preferably in optimized patterns, and herein lie three acute problems: (a) What are the interactional effects among two or more communication modes, e.g., sight and hearing and tactile modes? (b) What are the modes that are the most effective for defined kinds of learning tasks and for different learner characteristics? (c) How can estimates be made of the trade-off values in selecting and communicating theoretical concepts?
5. There was an agreement on a theme that was frequently reinforced, namely, that facilities acquisition and equipment developments had greatly out-distanced instructional program production and services for all media except print. Furthermore, the model of

> procurement used by publishers of instruction content and its organization and validation, seems not to be an effective model for the nonprint electronic media.

Systematic Approaches and Methods. The systems approach in education is being widely recommended and accepted on theoretical levels. The Systems Development Corporation, the Human Resources Research Organization, the American Institute for Research and many companies like IBM and RCA have developed and are promoting the concept of systems of instruction.

Generally, there has been oversimplification of the concept to the point where heterogenious assemblies of media have been described as systems. More correctly, a system includes all of those components, elements, factors, operations, and conditions which are significantly related to the results and objectives of a defined educational effort. The people parts of a system are often the most important determinants of the system's level of performance.

Thornton and Brown, in their excellent book, New Media and College and University Teaching (published by the Department of Audiovisual Instruction, NEA, in collaboration with the American Association for Higher Education) defines an instructional system as follows.*

> The materials, equipment, and other interrelated elements (including human components) of an assemblage that operates in an organized manner in handling the appropriate encoding of instructional messages and the distribution, use, and refinement of information. To be effective such a system must be sensitive to various stimuli and include elements for appropriate response, feedback, and adjustments. (p. 119)

Major Faults. With an understanding of the complexity of interacting factors in ordered interactional systems that affect the quality of media programs, it becomes clear that we are now in a position to diagnose faults, weaknesses, barriers, and barricades, in the instructional media programs, and thus we are in a position to correct them. What are some

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*Thornton, James W. and Brown, James W. New Media and College Teaching. Publication-Sales Section, National Education Association, 1201 Sixteenth St., N.W., Washington, D. C. 20036. pp. 185. 1968.

major faults in instructional media programs of schools, colleges and universities?

1. Failure to meet the difficult requirements of completing and perfecting the design phase for the sequential operations, and in particular, the failure to write performance specifications which are then compared with learning results or the changes in the behavior and performances of students.

2. Failure of not properly and accurately estimating and providing the essential resources of time, human competencies, funds, facilities, and materials that are essential for producing, testing, and effectively using media units and programs. The attitudes of educational poverty and unrealistically low expectancies associated with poor management result in attempts to do too much with too little. These conditions have dominated and deteriorated vast numbers of media programs and have made them ineffective even though acceptable locally where produced. "The wine is bitter but it is our wine."

3. Failure to provide adequate physical bases for work, including buildings, equipment, and facilities. Especially the lack of trained technical and professional people who have advanced skills in educational media production.

4. Failure to solve the nonprint library problems. Lack of access or difficult and delayed access to nonprint materials for use are major barriers to incorporating effectively media materials in instructional programs both in their preparation and production stages and in using them.

5. Failure in the area of inappropriate or ineffective conditions of use. Good distribution systems from media resource centers or from other sources are rare. Display systems in classrooms could be greatly improved. As a consequence, there is faulting of potentials for student interactions as well as restricted utility which increases costs per unit of instruction. Institutional independence and autonomy, the lack of broad cooperation, and the resulting limited utility, even of the few good materials, constitute a major fault in the application of contemporary media systems. In this connection, the use of distributive media and procedures could be a corrective step, and extensive interconnections as proposed by EDUCOM would be highly desirable national developments.

6. Failure to overcome passivity of the learner, involving the lack of response arrangements and records of the performances of students in mediated learning systems. Related is the frequent failure to provide for learners knowledge of results of their efforts to learn, and suitable reinforcement at the proper time and in the most effective form. The reactive and responsive media including those that are computer regulated are beginning to correct this fault.

Two Positive Suggestions. There are two considered and much debated proposals which, when applied, will reduce the resistance to the acceptance of media programs and greatly increase their instructional effectiveness. These proposals are aimed at levels of instruction from junior high school through higher, continuing, and professional education.

First, interactions of students with media productions and presentations should be directly with the information, the content, the stimulus materials. This kind of interaction can reduce many interference factors, including those related to activities of teachers, and can provide focus of attention in the perceptual fields for learners and clarity of meaning for the student. The potential for both individual and group learner interactions should be exploited. The focus proposed is on the essential primary information and not on a human mediator or teacher. Therefore, another favorable condition is accomplished: the avoidance of the introduction of a surrogate teacher into the learning situation because such surrogates may meet resistance from the person directly responsible for instruction and for the students in situations of use. Finally, if the materials can be kept cohesive, short, and flexible so that the new and adaptive patterns and sequences can be arranged by teachers and learners, levels of acceptance and use may be increased greatly as a consequence of involvement factors.

The second positive proposal is a radical reorientation in many current practices of producing and using instructional materials. It is that carefully produced and empirically tested instructional units should deal with the very core of units of courses for learning. The units of the course should be carried in the proper form by the required media and have included the basic essential conditions and regulators of that unit of learning. The units should have instructional completeness of treatment and be tested against what is required for a high level of learning. Instruction that is media based should not be complemental or supplemental to what a teacher does, but rather the other way around, the teacher should adapt, apply, explicate, and extend the mediated core materials.

Problems, Questions and Recommendations*

The discussions of the harvest seminars have led to the formulation of the following recommendations which have been made available to the Commission on Instructional Technology.

SOCIAL NEEDS

1. There is an ubiquitous need for "on-the-job" training and information programs for working teachers. Radio and television local, regional, and national network programs could be used as a means of reaching and informing millions of teachers throughout the country.

   What proposals of the commission could create the "will" to do this and provide effective programs for the unlimited task of teacher training and development.

2. Assuming that solutions to social needs and conditions require accelerated rates of change, by the application of modern communication technology to education, it would be a possible means of achieving appropriately these degrees and rates of social change.

GOALS AND PURPOSES

3. National goals for education require continuous study; therefore, a national commission may be desirable to study continuously national goals and how they may be achieved including the uses of technology.

4. Periodic reformulations should be made in statements of national goals and policies reflecting current social needs and trends of social change. How are these adaptive reformulations to be accomplished?

5. Application of systems analysis to school and college work requires evaluations in terms of learning as an end product or outcome; therefore, the consideration being given to requiring minimum standards of learning on a national basis is supportive of the recommendations for using the system analysis approaches to education and technology for getting the job done.

PLANNING AND LEGISLATION

6. Planning, designing, and administering educational enterprises require knowledge of the potentials and uses of instructional

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*The important contribution of Lane E. Carpenter to the work of abstracting and formulating this statement is acknowledged.

technologies by the responsible and principal planners and administrators of education. The appropriate employment of instructional technology cannot be included in educational planning by peripheral technologists who do not participate in central and important planning operations.

7. Informed opinion holds that the future will bring great increases in the speeds and capacities of computer centers which can be used on a cooperative basis by many different institutions. One problem is to develop effective educational uses of this great and growing computer capacity: (1) for regional and national administrative data, (2) for direct instruction, (3) for storing research and development data on a wide range of defined problems, and (4) for training uses and operation of computers.

8. What proposals could be the basis for creating search and scanning procedures for excellent existing instructional materials and for producing new programs of instruction and providing new supplemental units?

9. Policies are needed which would broaden and extend the many narrow and limited research and development projects conducted with federal funds, and also, to encourage creative inventiveness in the development and production of instructional materials.

10. The use of satellites requires many decisions in the near future which educators are not prepared to make. What should be done to ensure timely and valid decisions of the educational and instructional uses of satellites distribution systems?

11. Procedures are needed for vigilant and continuous definitions and redefinition of the problems of educational-instructional technology, and for designing and proposing solutions. What agency can be proposed which will serve these functions?

12. The commission should recommend whatever needs to be done at the national level to teach educators to write clear and intelligible specifications for apparatus, equipment, and programs to meet instructional needs.

13. How can educators and industrial people of like interest make arrangements to work together from the statements of educational needs and problems through all steps to design equipment, facilities, and program development which will meet the needs and help solve the acute problems of instruction?

14. There is an urgent need for authoritatively based descriptions of the scale of priorities of needs and instructional functions, and descriptions of the characteristics of the peoples to be served by specified media and media configurations wherever they live.

15. Learning theories are needed for planning educational developments; therefore, a task force of distinguished scholars and psychologists should be appointed and supported continuously to work for sustained periods on the formulation of valid and useful guiding theories related to the practical management of learning processes. A part of the responsibility of the Learning Theory Task Force would be to derive a system of theories of teaching and another system of theories of media applications, use and educational orientation of those who use media, especially the producers of instructional programs.

16. Planning should be done which estimates accurately the practical requirements and alternatives of adequate means, including the uses of instructional technology for reaching important educational goals, and thus, assist moving education out of an accepted and prevailing culture of poverty.

17. The systems approach, including multi-media design features, suggests that a number of federal agencies and organizations now serving special media could be consolidated, coordinated, and related to more general educational functions and purposes.

18. What can be proposed to foster the creative production of varied and effective programs of instruction which serve principal functions of teaching and provide the essential conditions for learning? For example: Interactance? Responsiveness? Feedback? Personalization? Individualization? Responsible effort? Congruence of scope with complexity? Developing learner autonomy?

19. Rarely have the new broadcast media been used for testing and assessing learning progress, yet excellent models of possibilities exist for using these media for different kinds of testing and evaluations. What proposals can be made to foster development of the uses of measurement, testing, and assessment with appropriate media technologies?

20. What procedures and precautions are necessary to prevent mismanagement in the purchasing of equipment, its lack of use, and its misuse?

21. A large and growing amount of computer time is available which could be used through telephone interconnections for research development, training, and direct instruction. What is required to encourage the use of available and increasing amount of computer time and capacity?

ORGANIZATIONS, AGENCIES, AND INSTITUTIONS

22. A system of national production centers for instructional materials should be planned and financed both with capital and operating funds. This should be a production network and not a broadcasting network. The system will need coordinating on the state, regional, and national levels. What should the commission recommend?

23. In case instructional production centers or laboratories are recommended, the question may arise of how the centers may be characterized. The following statements begin this characterization.

    a. They should be funded on a permanent basis.

    b. Centers would use teams of experts in content, productions, evaluation, and other essential functions.

    c. Centers should be free operating agencies without overlays of too much federal and state administrative control.

    d. All production must be tested under conditions of actual use.

    e. Centers must be responsive to the educational "marketplace."

    f. Centers must be staffed by highly trained specialists who speak a common language.

    g. The centers must be very well equipped.

24. Generally, throughout the country, the tendency is for schools, colleges, and universities to try to build their own <u>independent</u> and <u>complete</u> production facilities. A considerable body of opinion would have this supplemented by cooperative efforts, shared facilities, and shared uses of products.

25. The established research and development centers and regional education laboratories should be urged to provide and focus on efforts of using technologies as development forces, both in formal and informal instruction.

26. Institutions which train teachers at all levels should conduct media familiarization and indoctrination programs, and they should be provided with the best materials, new equipment, and financial support for this instruction.

27. Universities are important "change agents" and, therefore, should be given special means and responsibilities for appropriately introducing instructional technology into education at all levels of the educational system.

28. There is need for new extra-educational agencies or changes in old agencies, along with a corps of trained professional people to use <u>effectively</u> existing and emerging educational-instructional technologies for solving national problems and meeting social needs. What new agencies can the commission describe on the federal level?

29. There should be established working <u>instructional laboratories</u> as places where a full range of new equipment and apparatus is being used successfully for carrying out the essential sets of functions of teaching and for providing favorable conditions for learning. Such laboratories should have the most modern and proved types of equipment, and therefore, they should be magnificent showcases of the recent developments for industry. The laboratories should have frequent replacement of new equipment so that the latest models would be always on display.

30. What can be recommended for reorganizations of educational institutions that will prepare the way for the justifiable acceptance and use of instructional technology?

31. Support is needed for a wide range of experimental explorations in searching for new and effective kinds of programs for instructional technology. The pattern of proposed effort would be more like that of the "experimental theater" than like analytical experiments dealing with controlled variables.

PUBLIC RELATIONS, INFORMATION, AND DISSEMINATION

32. The general public, and many special publics, urgently need new and valid information about schools and colleges and related technologies. Therefore, it is advisable to recommend the use of an extended base of the broadcast media to describe, demonstrate, and inform the public about instructional technologies and their effective uses in education.

33. Educational efforts should be made to convince educators of the validity and efficaciousness of "representative" (symbolic) communications compared with real three dimensional objects. By using media, models of good teaching may be made more informative than actual "in-person" demonstrations. Also, some chemistry, biology, and physics demonstrations can be made more informative than some kinds of regular laboratory exercises.

34. Programs are needed to describe vividly and to explicate social issues and educational efforts as a means of informing the public about education. How can the public and legislators be informed about the availability, potentials, and valid uses of instructional technology?

35. The public is probably confused about, or does not make discriminations between, instructional and public television and radio, and between these and educational television and radio. Therefore, the commission must clarify these distinctions as a basis for making recommendations.

36. To be convincing, there needs to be some clear, evident, and dramatic cases of successful applications of instructional technologies, and the setting for such demonstrations could be the "inner" or the "central" city or impoverished rural areas.

37. What proposals can be made to implement the multi-media systems approach when currents of opinion run so strongly for working with separate media? Instructional television, for example, is itself a multi-medium. Consideration from the system's point of view must be given to all channels and modes of television as well as to relevant events before and after instruction by television. How can these complex ideas be made clear to the public and to teachers at all levels of education?

38. What proposals can be made for providing information about plans and productions of programs for the media which will serve as a basis for reducing the amount of duplication throughout the nation of productions of instructional units, courses, and curriculum.

PROFESSIONAL AND EDUCATIONAL DEVELOPMENT AND TRAINING

39. Attention should be given to the rewards and incentives and to changes in values that attract college and university professors of superior talent to the demanding work of producing instructional programs.

40. Means and programs must be proposed for meeting the acute shortages of professional people who are especially qualified to work in the media field and especially for producing and testing instructional programs.

41. There needs to be a clear definition of the roles of teachers and the roles of "technology" and their interactions, as well as interactions with different levels of learning, subject matter, and learning audiences.

42. How can the fear be reduced of the threat of mediated instruction to the statuses of teachers? What compromises in the interest of gaining acceptance can be made at the various levels of the educational system?

43. Process histories should be made and shared of research and development projects, especially of those dealing with the production of instructional materials, so that both what was done rightly and what was done wrongly can be known and reviewed.

44. Programs of graduate training are needed which emphasize the development of science educators in order to produce more scientists. The same need for professional development exists in other fields.

45. Professional development in curriculum design should require advanced professional training in communications using media for subject specialists, media professionals, and those people who organize curriculum.

46. The training of professional media producers required interdisciplinary development in three areas: content, learning theory, and message design, now therefore, how is this interdisciplinary training to be provided by universities that are so tightly organized along departmental lines.

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